Cambridge Assessment International Education

Cambridge International AS & A Level

BIOLOGY **9700/11**

Paper 1 Multiple Choice **May/June 2023**

1 hour 15 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

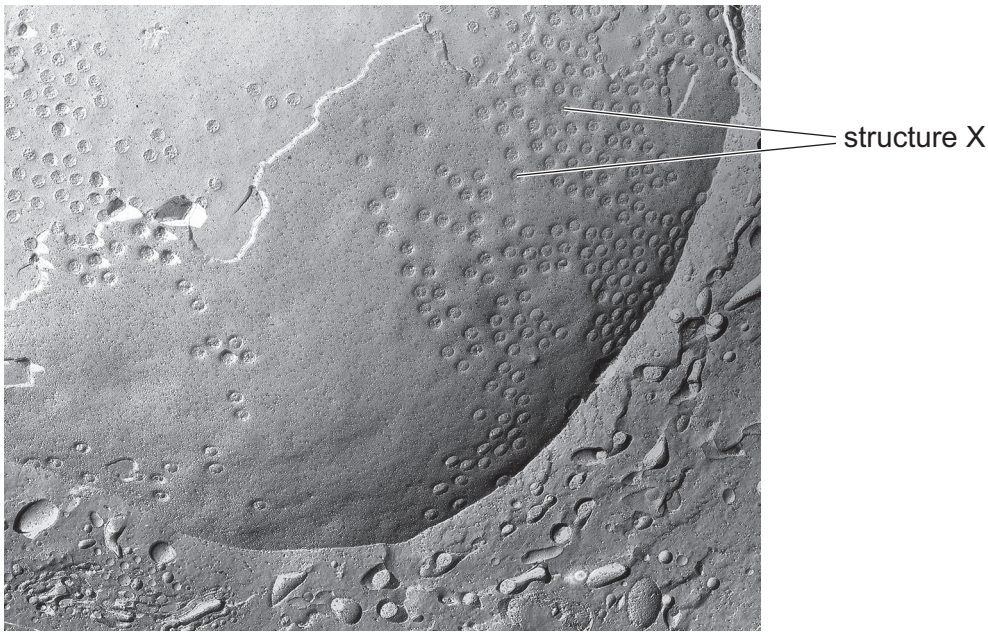
INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

This document has **20** pages. Any blank pages are indicated.

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1 The electron micrograph shows onion root cells prepared using a freeze-fracture technique. The cells were quickly frozen and then physically broken apart. Freeze fracture breaks apart cells along weak areas, such as membranes and the surfaces of organelles.



×20 000

Which statement best explains the appearance of the electron micrograph?

A The cells were broken apart at the endoplasmic reticulum; structure X is a ribosome.

B The cells were broken apart at the nuclear envelope; structure X is a nuclear pore.

C The cells were broken apart at the nuclear envelope; structure X is a ribosome.

D The cells were broken apart at the tonoplast; structure X is a plasmodesma.

2 Which cell structures can form vesicles?

	cell surface membrane	endoplasmic reticulum	Golgi body
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

✓ = can form vesicles

✗ = cannot form vesicles

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3 Four students were asked to match the function with the appearance of some cell structures in an animal cell.

The functions were listed by number.

1 synthesis of polypeptides

2 synthesis of lipids

3 packaging of hydrolytic enzymes that will remain in the cell

The appearances were listed by letter.

V membranes which surround an enclosed inner cavity

W non-membrane-bound, spherical structures

X a double membrane interspersed with pores

Y non-membrane-bound, cylindrical structures

Z membrane-bound sacs, arranged as a flattened stack

Which student correctly matched the numbered function with the appearance of the cell structure?

	1	2	3
A	W	V	Z
B	W	Z	Y
C	Z	W	Z
D	Z	V	W

4 Which cells contain a tonoplast?

	root hair	companion	sieve tube element	endodermis
A	✓	✓	✓	✓
B	✓	✗	✓	✓
C	✗	✓	✓	✗
D	✓	✓	✗	✓

key

✓ = contain tonoplast

✗ = do not contain tonoplast

5 Which organelles found in animal or plant cells are surrounded by double membranes?

A chloroplasts, mitochondria, vacuoles

B chloroplasts, mitochondria, nuclei

C chloroplasts, nuclei, vacuoles

D mitochondria, nuclei, vacuoles

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6 Some scientists think that mitochondria evolved from bacteria that entered the cytoplasm of a different cell and were able to survive there.

Which structural features of mitochondria support this hypothesis?

	folded internal membrane	circular DNA	70S ribosomes
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

✓ = supports

✗ = does not support

7 What is present in all viruses, all prokaryotes **and** all eukaryotes?

A ribose

B deoxyribose

C cytosine

D thymine

8 The table shows some steps that can be made in carrying out the Benedict's test.

Which combination of steps is required to carry out a semi-quantitative test on a reducing sugar solution?

	standardise volume of Benedict's solution and volume of test solution	boil with hydrochloric acid and then neutralise with alkali	standardise boiling time with Benedict's solution and compare final colour with numbered colour standards
A	✓	✗	✗
B	✗	✓	✗
C	✓	✗	✓
D	✗	✗	✓

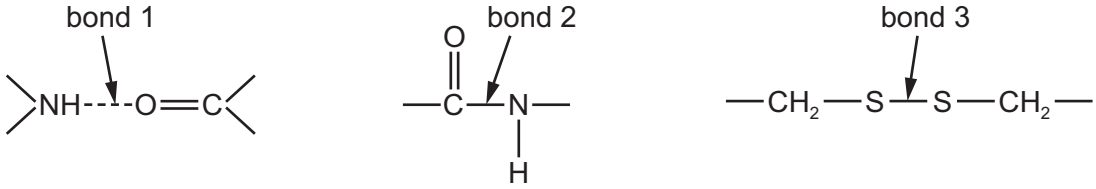
key

✓ = step made

✗ = step not made

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9 The diagrams show three examples of different bonds.



Which bonds hold the secondary structure of proteins together?

A 1, 2 and 3 **B** 1 and 3 only **C** 1 only **D** 2 and 3 only

10 Insulin is a globular protein involved in cell signalling. It is transported in the blood plasma from the cells that synthesise it to its target cells. A molecule of insulin contains six sulfur-containing amino acids and has two polypeptide chains.

Which statements about insulin are correct?

1 An insulin molecule has a quaternary structure.

2 Insulin polypeptides are held together by six disulfide bonds.

3 Amino acids with hydrophobic R groups would be found in the centre of an insulin molecule.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

11 Which statement correctly explains why blood plasma can be maintained at a stable temperature?

A It has a low specific heat capacity.

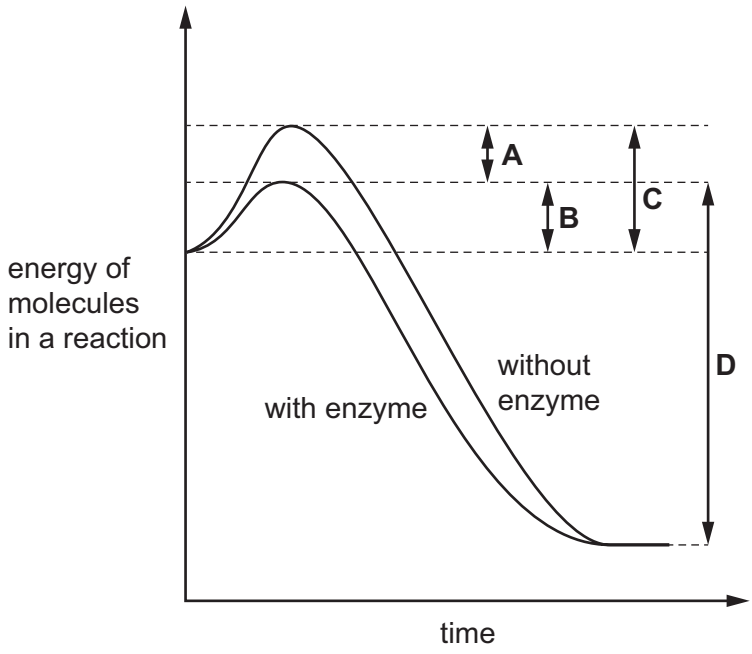
B It has a high specific heat capacity.

C It has a low latent heat of vaporisation.

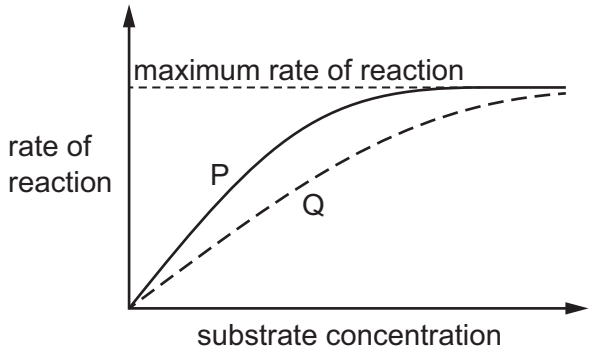
D It has a high latent heat of vaporisation.

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12 Which region on the graph shows the activation energy of an enzyme-catalysed reaction?



13 The graph shows the effect of an increasing substrate concentration on the rate of an enzyme-catalysed reaction.



Line P represents the result when the enzyme is used at its optimum pH and optimum temperature and without an inhibitor.

Line Q represents the result when the reaction conditions are changed.

Which descriptions of changes to the reaction conditions could result in line Q if all other conditions were kept the same?

1 Add an inhibitor that attaches to a site other than the active site.

2 Add an inhibitor that has a similar shape to the substrate.

3 Add an inhibitor that blocks the active site of the enzyme.

4 Carry out the reaction at a higher temperature.

A 1, 3 and 4 **B** 1 and 4 only **C** 2, 3 and 4 **D** 2 and 3 only

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14 Which statement about cell signalling is correct?

A One type of receptor molecule will recognise all ligands in the body.

B The binding of a ligand may cause a change to the shape of the receptor.

C The receptors for ligands are always found on the inside of cells.

D The same ligand is made by all of the cells in the body.

15 Four students, **A**, **B**, **C** and **D**, observed plant epidermal cells that had been placed in a concentrated sucrose solution for 30 minutes. They were asked to identify the partially permeable layer and to explain the appearance of the cells in terms of water potential and movement of water.

Which student is correct?

	partially permeable layer	water potential at start of experiment	movement of water during experiment
A	cell surface membrane	cell contents have a lower water potential than the sucrose solution	water moved out of the cell and no water moved in
B	cell surface membrane	cell contents have a higher water potential than the sucrose solution	more water moved out of the cell than moved in
C	cell wall	cell contents have a lower water potential than the sucrose solution	more water moved out of the cell than moved in
D	cell wall	cell contents have a higher water potential than the sucrose solution	water moved out of the cell and no water moved in

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[Turn over

16 The table compares the surface area to volume ratios of five agar blocks that differ in dimensions but which all have the same volume.

The agar blocks can be used to measure the efficiency of diffusion, where efficiency is measured as the time taken for a dye to reach all parts of the block.

	length / mm	width / mm	height / mm	surface area / mm^2	volume / mm^3	surface area : volume ratio
1	8	8	8	384	512	0.75
2	16	16	2	640	512	1.3
3	32	4	4	544	512	1.1
4	32	32	0.5	2112	512	4.1
5	64	4	2	784	512	1.5

Which prediction can be made about the way in which size and dimensions of these blocks affect the efficiency of diffusion?

A The efficiency of diffusion will decrease as the width of a block increases.

B The efficiency of diffusion will increase as the height of a block increases.

C The efficiency of diffusion will increase as a block of fixed volume is flattened.

D The efficiency of diffusion will decrease as a block of fixed volume is elongated.

17 The cell cycle includes mitosis.

What are features of this type of nuclear division?

1 forms cells of equal size to the parent cell

2 forms genetically identical nuclei

3 semi-conservative replication of DNA

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 only

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18 A student observed the cells in the growing region (meristem) of an onion root and obtained the data shown.

stage	number of cells
interphase	886
prophase	73
metaphase	16
anaphase	14
telophase	11

Which percentage of cells contains chromosomes that appear as two chromatids?

A 7.3% **B** 8.9% **C** 95.9% **D** 97.5%

19 Which statement about messenger RNA is correct?

A In eukaryotic cells, mRNA is made by removing exons from the primary RNA transcript.

B mRNA is a single-stranded polynucleotide containing a different purine base than DNA.

C mRNA molecules contain ribose sugars joined to phosphate groups by phosphodiester bonds.

D The monomers of mRNA contain a phosphate group, deoxyribose sugar and a nitrogenous base.

20 Which structures are involved in transcription only?

	DNA template strand	anticodons	RNA polymerase
A	✓	✓	✗
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

key

✓ = involved

✗ = not involved

21 One gene provides the code for the production of which type of molecule?

A amino acid

B DNA

C nucleotide

D polypeptide

22 The table shows some mRNA codons that code for certain amino acids.

mRNA codon	amino acid
GCG, GCA, GCC, GCU	alanine
ACG, ACA, ACC, ACU	threonine
UGC, UGU	cysteine
UAC, UAU	tyrosine
CAG, CAA	glutamine
CGG, CGA, CGC, CGU	arginine

A DNA template strand has the base sequence shown.

ACAGTATTATTTGCAACG

What would the change in the amino acid be if the first base in the fifth DNA triplet was substituted for an A base?

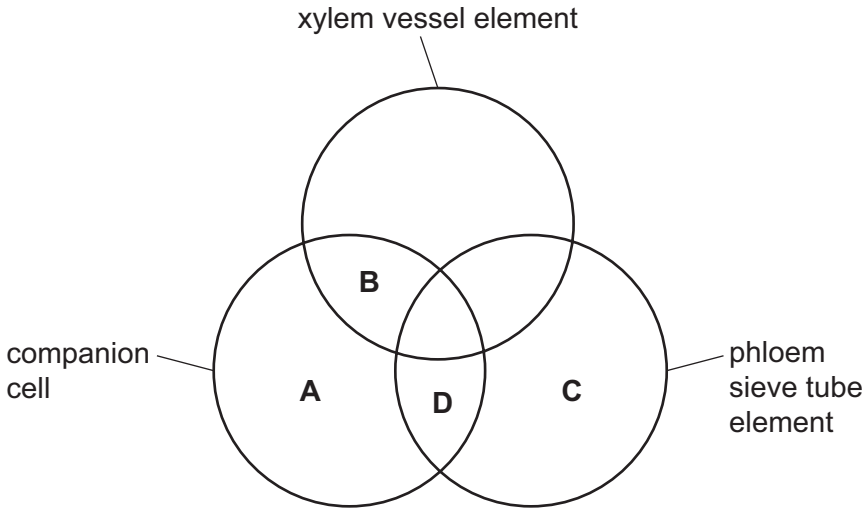
A alanine to cysteine

B alanine to threonine

C arginine to cysteine

D arginine to threonine

23 Which structures contain cytoplasm with mitochondria and a nucleus?



24 What is the correct term to describe intermolecular hydrogen bonding between water molecules?

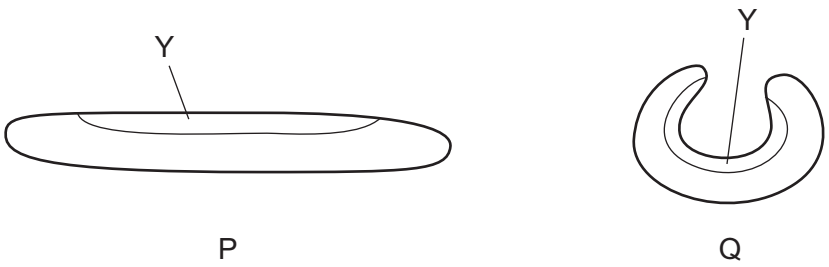
A adhesion

B cohesion

C osmosis

D diffusion

25 The diagram shows the outline of a xerophytic leaf that had been left for 45 minutes in different conditions, P and Q.



Which statements about the cells in layer Y of the leaf in each of the conditions P and Q **after** 45 minutes are correct?

1 There is a less negative water potential in P than in Q.

2 The cells may be turgid in P and plasmolysed in Q.

3 The cells are less turgid in P than in Q.

4 There is no net diffusion of water into Y in either P **or** Q.

A 1, 2 and 4 **B** 1, 3 and 4 **C** 1 and 3 only **D** 2 and 4 only

26 How does sucrose move from chloroplasts to the phloem?

1 diffusion

2 apoplast pathway

3 symplast pathway

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

27 How are companion cells involved in loading sucrose into phloem sieve tube elements?

A actively through cotransporter proteins and passively through plasmodesmata

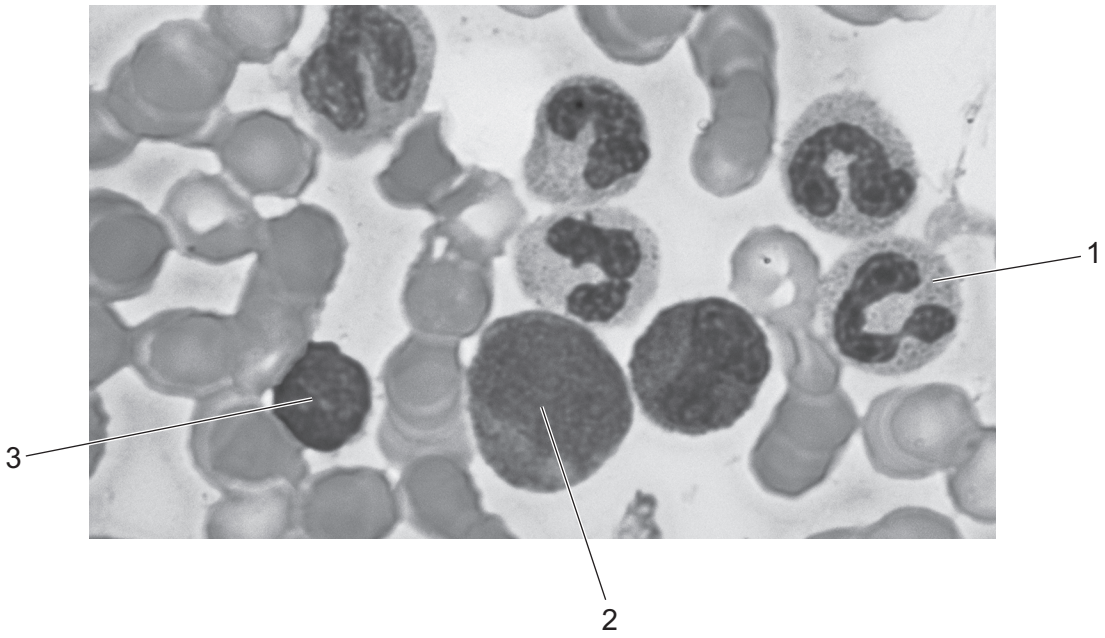
B actively through cotransporter proteins and plasmodesmata

C passively through cotransporter proteins only

D actively through plasmodesmata only

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28 The photomicrograph shows blood cells as seen using a high-power light microscope.

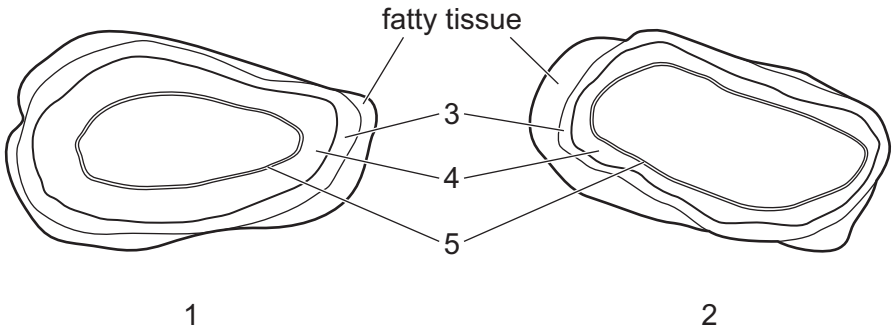


Which row correctly identifies the different types of white blood cell?

	1	2	3
A	lymphocyte	monocyte	neutrophil
B	monocyte	neutrophil	macrophage
C	neutrophil	monocyte	lymphocyte
D	phagocyte	lymphocyte	monocyte

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29 Plan diagrams of two blood vessels are shown.



Which labels are correct?

	1	2	3	4	5
A	aorta	vena cava	elastic fibres	smooth muscle	epithelium
B	artery	vein	collagen fibres	smooth muscle and elastic tissue	endothelium
C	vein	artery	collagen fibres	elastic fibres	squamous cells
D	coronary artery	coronary vein	elastic fibres	smooth muscle and elastic tissue	epithelium

30 What are found in blood and tissue fluid?

1 carbon dioxide

2 fatty acids

3 white blood cells

4 proteins

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 1, 2 and 4 only

D 3 and 4 only

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31 Which reactions would be slowed down by an inhibitor of carbonic anhydrase?

1 CO_2 + haemoglobin $\rightarrow$ carbaminohaemoglobin

2 $CO_2 + H_2O \rightarrow H_2CO_3$

3 $H_2CO_3 \rightarrow H^+ + HCO_3^-$

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

32 Which sequence of letters correctly identifies the order of events during the cardiac cycle?

T atrial walls contract

U impulse is delayed by a fraction of a second

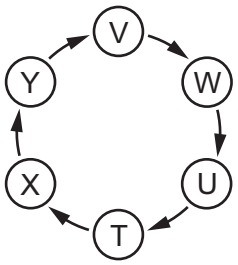
V wave of excitation enters the atrioventricular node

W wave of excitation passes down the Purkyne tissue

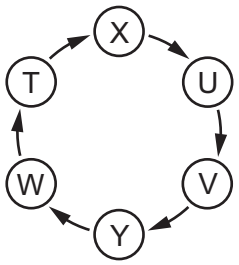
X wave of excitation spreads from the sinoatrial node

Y ventricles contract

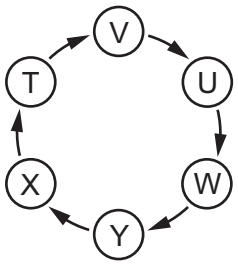
A



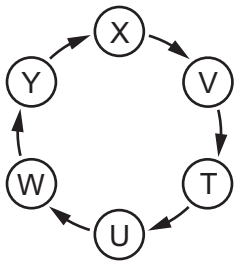
B



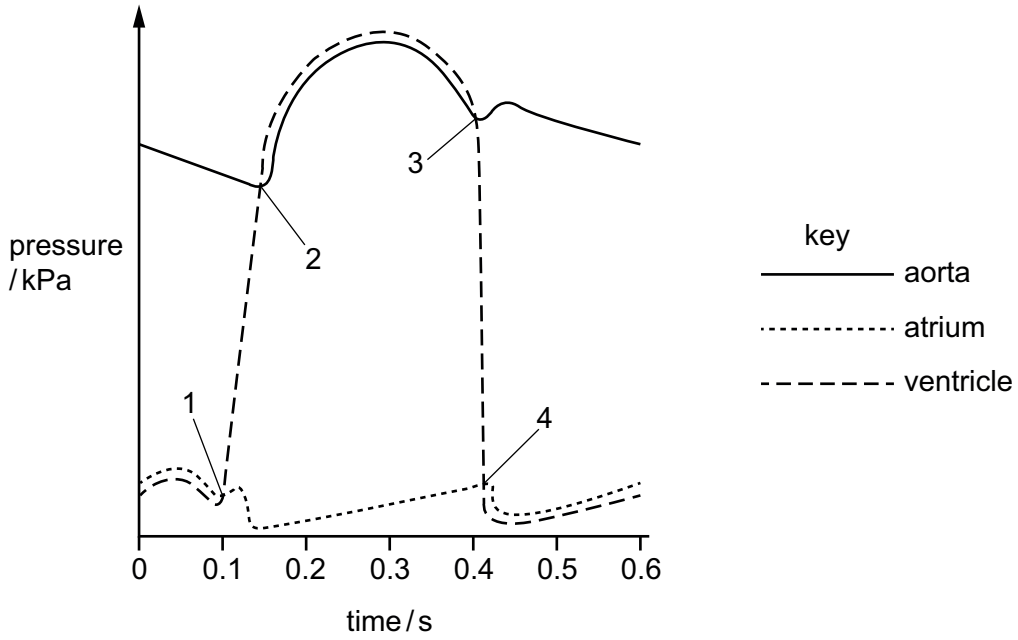
C



D



33 The diagram gives information about blood pressure in the left side of the heart during the cardiac cycle.



Valves open and close at the points numbered.

Which row identifies the valves opening or closing at the points numbered?

	atrioventricular valve opens	semilunar valve opens	atrioventricular valve closes	semilunar valve closes
A	1	3	4	2
B	2	4	3	1
C	3	1	2	4
D	4	2	1	3

34 A person with no breathing conditions rests for an hour. Their breathing in this time is shallow and slow, so little air from outside the body reaches the alveoli. The person's heart rate remains constant.

Which statement is correct?

A The carbon dioxide concentration in the blood in the pulmonary vein will be higher than in the pulmonary artery.

B Carbon dioxide molecules in the air of the alveoli move out of the blood by active transport.

C The air in the alveoli has a lower concentration of oxygen than the blood in the pulmonary vein.

D Oxygen molecules diffuse from the air in the alveoli into the blood at a slower rate than when the person is active.

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35 Which statements about **all** bronchioles are correct?

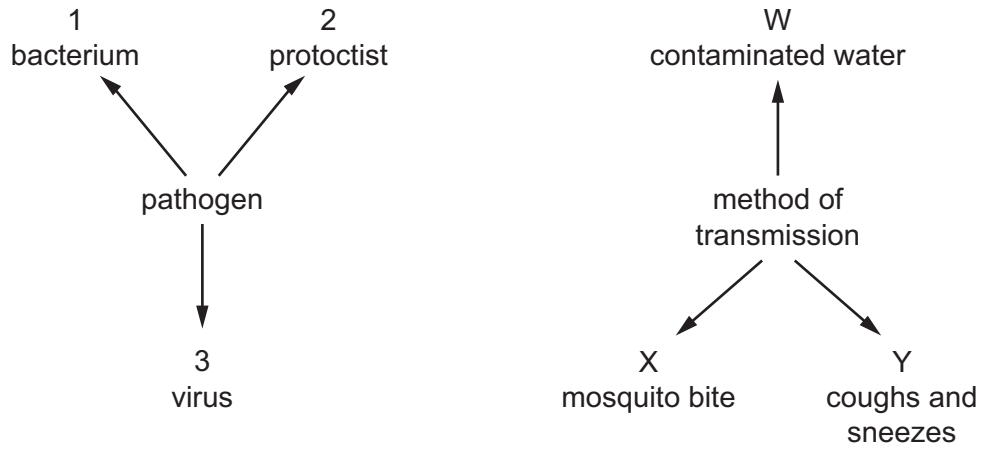
1 They have epithelium.

2 They have goblet cells.

3 They have muscle tissue.

A 1, 2 and 3 **B** 1 and 3 only **C** 2 only **D** 3 only

36 The diagram shows some of the pathogens that cause disease in humans and some of the ways they are transmitted.



What is the correct pathogen and method of transmission for malaria?

A 1 and X **B** 2 and W **C** 2 and X **D** 3 and Y

37 Some of the processes which result in the formation of a population of bacteria that are resistant to a new antibiotic are listed.

1 change in reproductive success of bacteria

2 increase in frequency of the resistance allele in the population

3 increase in genetic variation within the population

4 random mutation occurs in bacterial DNA

What is the correct order of these processes?

A $1 \rightarrow 3 \rightarrow 2 \rightarrow 4$

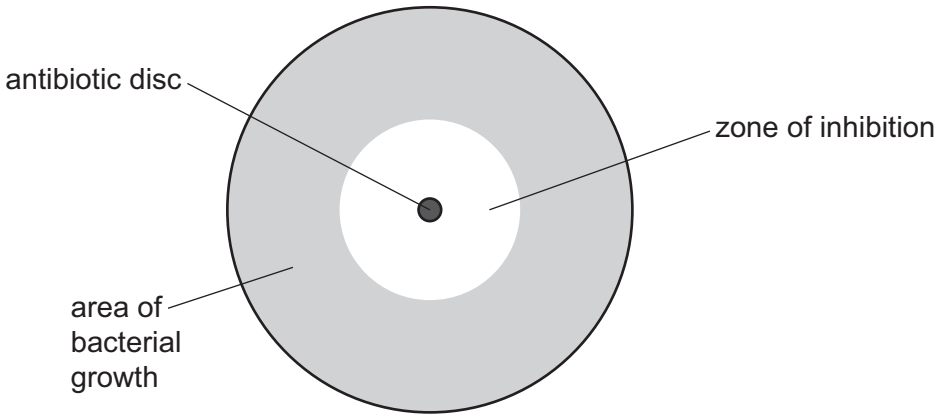
B $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$

C $3 \rightarrow 4 \rightarrow 1 \rightarrow 2$

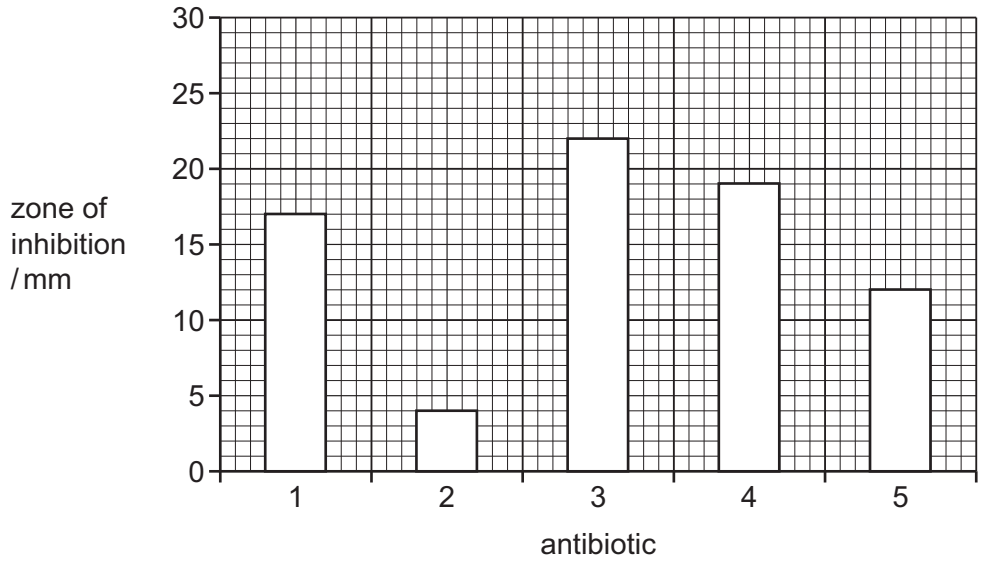
D $4 \rightarrow 3 \rightarrow 1 \rightarrow 2$

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38 When bacteria are grown in a Petri dish containing discs with antibiotics, there will be zones of inhibition of bacterial growth.



The chart shows the size of the zones of inhibition when a species of bacteria was incubated on five different plates of agar, each containing a disc with a different antibiotic.



Which conclusions can be made about the most and least effective antibiotics on this species of bacteria?

	most effective antibiotic	least effective antibiotic
A	3	2
B	4	3
C	3	1
D	2	3

39 Which blood cell type does **not** recognise, engulf and digest non-self particles?

A macrophages

B neutrophils

C phagocytes

D T-killer cells

40 Repeated infections with malaria result in more effective immunity to malaria.

Which type of immunity is responsible for the more effective immunity?

A artificial active

B artificial passive

C natural active

D natural passive

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